

REMARKS

The Applicants thank the Examiner for the careful examination of this application. Claims 1 - 7 are pending and rejected.

Claim 1 positively recites heating the semiconductor substrate to cause a portion of the dopant to diffuse from the coating into the semiconductor substrate and thereby form a P-N junction within the semiconductor substrate. Claim 1 also positively recites that prior to heating; an impurity atom forms a part of the crystal. These advantageously claimed features are not taught or suggested by the patents granted to Economikos et al., Tsunashima, and Lee; either alone or in combination.

Economikos et al. teaches away from the advantageously claimed invention because Economikos et al. requires two annealing processes: namely, a heat treatment in a non-oxidizing atmosphere followed by a heat treatment in an oxidizing atmosphere (column 3 lines 5-12, column 4 lines 15-23). Therefore Economikos et al. does not teach the formation of a P-N junction after a single heating of the coating as advantageously claimed. Furthermore, Economikos et al. teaches away from the advantageously claimed invention because Economikos et al. does not have an impurity atom that forms a part of the crystal prior to heating as advantageously claimed (column 5 lines 66-67, column 2 lines 45-48).

Tsunashima teaches away from the advantageously claimed invention because Tsunashima teaches the use of a p-type silicon substrate (column 5 line

54, FIGS. 3A-3D), not a semiconductor having an impurity atom that forms a part of the crystal prior to heating, as advantageously claimed. As a result, Tsunashima teaches diffusion control by the modification of the dopant in the doped glass film (column 5 lines 33-35, and 49-52), not by modulating the diffusivity of the dopant in the silicon layer through the presence of an impurity atom as advantageously claimed. The Applicants submit that the presence of impurities like hydrogen and fluorine in the oxide lead to the enhancement of the diffusion of dopants like boron in the oxide; thus the teachings of Tsunashima lead to deeper junctions with the hydrogen filled glass (not the ultra shallow junctions achieved with the advantageously claimed invention).

Regarding Claim 6, the Applicants note that the peak dopant concentration taught in FIG. 4 of Tsunashima is lower than the dopant concentration advantageously claimed. Therefore, Tsunashima teaches a structure having the clear disadvantage of increased sheet resistance.

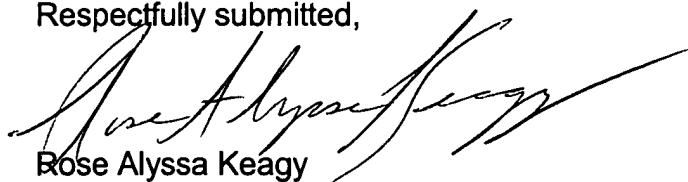
Lee teaches away from the advantageously claimed invention because Lee teaches that the dopant is ion implanted (column 2 lines 49-67). Therefore Lee ('337) teaches away from the advantageously claimed step of causing the dopants to diffuse from the coating into the semiconductor substrate. In addition Lee does not teach that the semiconductor substrate is a single crystal or that the semiconductor substrate comprises a single crystal having an impurity atom forming a part of the crystal, as advantageously claimed. Lee further teaches away from the advantageously claimed invention because Lee teaches the use of a BPSG coating only as an insulating film at a location separated from the

source and drain (column 1 lines 33-36, FIG. 1). The Applicants submit that Lee does not teach the use of the BPSG coating for active junction formation. Contrary to Lee, the Applicants teach the use of a BPSG coating as a source for the dopants at a location adjacent to the source and drain (see Applicants FIG. 1 and the Specification's page 6 line 27). Thus, the Applicants' invention achieves an abruptness that is much better than what is possible through the teachings of Lee (who doesn't teach the use of impurity atoms such as fluorine).

Therefore, the Applicants respectfully traverse the Examiner's rejection of Claim 1 and respectfully assert that Claim 1 is patentable over Economikos et al., Tsunashima, and Lee; either alone or in combination. Furthermore, Claims 2-7 are allowable for depending on allowable independent Claim 1 and, in combination, including limitations not taught or described in the reference of record.

For the reasons stated above, this application is believed to be in condition for allowance. Reexamination and reconsideration is requested.

Respectfully submitted,



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